Current information architecture trends in digitized cartography collections

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Abstract

This paper provides an analysis of the Information Architecture (IA) of websites of organizations devoted to assembling and disseminating collections of digitized nineteenth century maps. For this purpose, researchers examine the following website features: Identity and Information, Language and Writing, Labels/Headings, Site Structure and Navigation, Display of Information, and Search and Help functions. This examination reveals both strengths and weakness of each website, while also underscoring how poorer performing websites might improve. A questionnaire designed

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in previous research and adapted to this sample was applied. The analysis of each organization provides a qualitative assessment of the data gathered, and relevant conclusions are drawn from aspects assessed.

Keywords: Digital Map Libraries; Information Architecture; Historical Maps.

Resumen

Tendencias actuales de arquitectura de información en colecciones cartográficas digitales españolas
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El objetivo principal del presente trabajo es realizar un análisis, tomando como punto de partida la Arquitectura de la Información (AI), de los sitios web de entidades que recogen material cartográfico anterior a 1901 en formato digital y lo difunden a través de Internet. Para ello se examinan aspectos relacionados con los siguientes ítems: Identidad e Información, Lenguaje y Redacción, Rotulado, Estructura y Navegación, Presentación de la Información, Búsqueda y Ayuda. Se pondrá de manifiesto cuáles son los puntos fuertes y débiles de cada entidad, reflexionando cuál ha de ser la tendencia que deben tener las entidades cuyos resultados sean más negativos.
Para desarrollar dicha evaluación, se ha elaborado un cuestionario a partir de trabajos previos, adaptándolo a la muestra objeto de estudio. El análisis individual de cada organismo conlleva una valoración cualitativa de los resultados obtenidos, extrayendo las conclusiones más relevantes sobre los aspectos evaluados.

Palabras clave: Cartotecas Digitales; Arquitectura de la Información; Cartografía Histórica.

Introduction

Information Architecture (IA) is defined as the science or discipline that organizes and structures web sites so the user can locate, gain access to and use the information they contain (Pérez-Montoro Gutiérrez, 2010; Rosenfeld and Morville, 2002).

What makes a website attractive to the user is the contents it holds. To this end, it is important to be clear about just what to show on each page or section, how to group content, how to display it and under what tags, etc. IA focuses on these issues in order to help websites be inviting to users.

The user who enters a cartography webpage comes with specific needs: he wishes to see diverse collections of maps or find concrete documents quickly and easily. The maxim of IA is "Everything where it is expected." When a website fails to live up to this motto, the *user's experience* and the site *usability* may be deemed poor. Both of these aspects are directly related to the webpage design, where IA is a determining factor. As such, any site, including a map archive site, must provide users with all of the information demanded and display it just as the user wishes to see it.

In general terms, an information architect is the professional devoted to refining the objectives of the site, providing a functional profile for the contents and designing how information can be found. IA relies on series of interdependent components or systems that allow relevant information of each website to be found and retrieved. To achieve this with any efficiency, a standardized language must be adopted and employed for each of the following systems:

1. By means of the diverse schemes and structures, the *system of organization* takes care of planning and organizing the websites to make them useful. The first are centered on grouping and classifying the items of information under a criterion (by topic or chronology, or alphabetically). Meanwhile, the structures establish the interdependencies of each of the groups previously established.
2. The *labeling system* shall conceptualize each of the options, groups or links used in the site. The object is for these labels or headings to posit a mental representation of the content they hold.
3. The *navigation system* shall allow the user to move within the site while also providing a method for orientation. In this way the so-called *cognitive overload* is prevented. Said systems may be global (navigation menus that exist on every page of the site), local (planned for a specific page) and contextual (those that allow movement between contents).
4. The *search system* shall facilitate the localization and retrieval of what the user demands. As stated by Pérez-Montoro Gutiérrez (2010), proper implementation is based on a balance between information displayed in search results and the total number of results achieved.

In this light, the main aim of this paper is to analyze Spanish map archive websites from the standpoint of IA.

From cartography to the digital map archive

The concept of cartography comes from the Greek *chartis*, meaning map, and *graphein*, which means written. Of the many definitions one might find, we cite the one provided by the International Cartographic Association (ICA), which states: "the art, science and techniques for making maps, charts and sections, three-dimensional models and globes representing Earth or any other heavenly body in any scale" (Zentai, 2012: 7. Translated from Spanish).

The United Nations Organization, meanwhile, defines cartography as "the art and science of creating a two-dimensional representation of a given part of earth's surface. The features represented may be real objects (topographical maps) or concepts and features that are more abstract (topical maps)" (ONU, 2000: 202. Translated from Spanish). Finally, the official website of the Instituto Geográfico de Venezuela Simón Bolívar (2011. Translated from Spanish) defines cartography as: "the art of making maps or the technique of making a flat representations of the spatial components of the earth, including the activities and developments of man."

On the basis these definitions, cartography may be understood as the science, art and technique of representing a territory and it features. The definition of what a map is was taken up by the 17th General Assembly of the ICA, which proffers the following definition:

> A symbolic image of geographic reality, representing selection of details of features, which is the result of the creative preferences and efforts of the author and designed primarily to depict spatial relations. (Hansen Albites, 2008: 9)

As stated by Fallas (2003: 1), a map is "the graphic, scale representation of a portion of the earth's surface showing only some features or attributes of the reality." Thus, the basic data gathered in this paper are:

- Title
- Date of data gathering and date of publication
- Legend, detailing the equivalence between information gathered in the map and its representation of the same

- Projection and *datum*: essential information needed to process and handle a map within a geographic information system (Fallas, 2003).
- Scale: the ratio between the reality and the map dimensions
- Author: person or entity creating the document
- Source, indicating primary sources (traveler and explorer logs, field study, tele-detection studies) or secondary sources (other maps and documentary sources) (Hansen Albites , 2008).

In light of these general ideas regarding cartography and maps, what are we to make of digital cartography? While analogue cartography is printed, frequently using polyether paper support,[1] digital cartography requires computer assisted systems and programs (computer or CAD assisted design) in its design, treatment and use. It also requires geographic information systems and spatial data infrastructures, etc. The usefulness of digital cartography is quite varied and depends on the topical context in which it is used. As a whole, it acts like many other disciplines of knowledge, which implies that it is not working in a vacuum. According to Marín Hernández and Vargas (2010):

> […] the impact of the information systems has occurred in several areas: uses of SIG as tools and instruments to aid public management and decisions making, development of economic geography, urban question or rational cartography in cultural, social and political terms [among others].

Along these lines, Zentai (2012: 8. Translated from Spanish) explains that "the function of maps has changed considerably in the digital age: maps are no longer simple products, and now are special collections of information that offer a growing array of functions by exploiting the data base behind the map." The image of the map on screen, in this conception, hides the data used to create it.

On this basis, the earlier idea of digital cartography may be understood as the product of digitizing and processing old maps, for the case at hand, those drawn before 1901. It is based on scanning or photographing old maps and manipulation of the image in order to achieve the highest yield, whether offering such products to the user (main mission) or for inclusion in the Spatial Data and Geographic Infrastructure Information Systems (e.g., by means of geo-referencing). Since such sources are already published and written,

1 The current standard in Spain specifying the support paper for maps is UNE 57.048-77, titled: *Papel. Papel cartográfico para usos generales.* (AENOR, 2011).

their data cannot be manipulated. As such, the trend in this field is to employ information resources techniques to enhance the performance of this type of documents.

The following is a list of standards that are useful in the description of these documents and the exchange of information with other organization. The firts two standards are for making general descriptions of documents, and the remainder are for describing general geographic information.

- ISBD (CM): Bibliographic description and identification for cartographic material that orders descriptive elements and provides a points system for the same. This is used largely in libraries.
- Dublin Core (Weibel and Koch, 2000): Metadata model created and promoted by the Dublin Core Metadata Initiative (DCMI), which develops and maintains the specifications to support the description and standardization of resources, allowing the description of all kinds of resources regardless of format, area of specialization or cultural origin (Sánchez Maganto, Nogueras Iso and Ballari, 2008).
- ISO 19115:2003: Metadata standard that defines a scheme for describing geographic information and the services it provides. It provides information about the identification, measurement, quality, spatial-temporal scheme, spatial reference and the distribution of the digital geographic data.
- Núcleo Español de Metadatos (NEM): The Spanish Metadata Nucleus establishes a set of the minimum recommended metadata needed for proper description of resources associated with geographic information (series of complete product, sheets or units, etc.) within Spain (Sánchez Maganto, Nogueras Iso and Ballari, 2008).

Finally, the matter of cartographic archive or map collection (*cartoteca*, in Spanish-language coinage) is addressed. Despite the fact that the term is in wide use, it does not appear in the Diccionario de la Real Academia Española de la Lengua.[2] We understand *cartoteca* to mean the set of cartographic documents gathered and catalogued by specialized personnel for later use and dissemination. These map archives exist for the purpose of disseminating such information, either through on-site consultation or over the internet. Otherwise they would become mere document depositories. This dissemination

2 Nonetheless, there are initiatives such as that undertaken by Luisa Martín Merás, who has requested the inclusion of the term *cartoteca* in the 23rd Edition of the *Diccionario de la Lengua Española* (Blanco García, 2010).

can be carried out facsimile, microfilm, slides, etc. Nonetheless, the method most often used today is the digital image form offered in online collections.

Thus, a digital *cartoteca* is a repository of digital indexes that allows viewing and downloading of cartographic contents, while also providing relevant metadata and catalogue descriptions, as per ISBD, MARC or XML formats. Its creation allows both the general and specialized user to consult catalogues and materials from the conservation center at any time. As stated by Fernández Wyttenbach and Bernabé Poveda (2011: 132. Italics added. Translated from Spanish):

> *Virtual cartotecas* are the solution for enjoying access via internet to antique map collections distributed by diverse libraries and archive around the world […]. Internet access to map collections multiplies the applications that facilitate the work of researchers and document specialists, while promoting the publication and dissemination of cartographic heritage.

Methodology

This paper uses an IA perspective to assess the websites run by online historical cartographic archives. The data was gathered from October 2013 to January 2014. Following the latest edition of the *Reglasde Catalogación* released in 1999, antique maps are all those released before 1901.

The process of selection of the cartographic entities was performed on the basis of the *Directorio de cartotecas y colecciones cartográficas en instituciones españolas* (Líter Mayayo, 2012) and the paper: "Evaluación de las interfaces de consulta de las Colecciones digitales patrimoniales españolas" (Sulé Duesa, Estivill Rius and Gascón García, 2011). The filters applied to achieve the sample were as follows:

- The sample was limited to organizations providing online access via internet; that is, to organizations that publish the digital image of the document.
- Inventories or catalogue services (OPAC) were excluded.
- Those that do not contain cartographic material are excluded as are cartographic archives sites that do not provide antique maps.
- The results of the following archives: Corona de Aragón, Archivo de la Real Chancillería de Valladolid, Archivo General de Simancas, Archivo Histórico Nacional and its Sección Nobleza, and the Archivo Histórico Provincial de Álava are embraced by the Archivo General de Indias.

This is because consultation of their respective collections is performed through Portal PARES (Portal de Archivos Españoles of the Ministry of Education, Culture and Sports (http://pares.mcu.es/). As such, the results can be extrapolated for this entire subset.

- Similarly, the specific results of the Biblioteca Digital de Castilla la Mancha, the Biblioteca Virtual de Aragón, the Biblioteca Virtual de la Rioja, the Biblioteca Virtual del Principado de Asturias or the Biblioteca Virtual Sierra Pambley are contained in the Biblioteca Regional de Madrid, all of which were designed by the same company (DIGIBIS Aplicaciones y estándares al servicio de la sociedad del conocimiento, www.digibis.com), so results can be extrapolated to all of these sites.

In this way, a sample of 22 entities was selected, which appear in *Table 1.*

Table 1. List of entities included in study sample.

ID	Entity	URL entity
1	Archivo de Villa. Ayuntamiento de Madrid (Memoria de Madrid)	http://www.memoriademadrid.es/index.php
2	Archivo del Patronato de la Alhambra y Generalife	http://www.alhambra-patronato.es/ria/handle/10514/16
3	Memoria Digital Vasca	http://www.memoriadigitalvasca.es/
4	Universitat de Lleida (Fons Sol-Torres)	http://soltorres.udl.cat/
5	Archivo General de Indias (PARES)	http://pares.mcu.es/
6	Archivo Histórico Provincial de Zaragoza	http://servicios3.aragon.es/opac/app/simple/ahpz
7	Archivo Real y General de Navarra (Biblioteca Navarra Digital)	http://www.navarra.es/home_es/Temas/Turismo+ocio+y+cultura/Archivos/Archivos/Archivo+General+de+Navarra/ (página del archivo) https://administracionelectronica.navarra.es/binadi/busqueda.aspx (página de la BND)
8	Arquivo do Reino de Galicia (Galiciana)	http://www.galiciana.bibliotecadegalicia.xunta.es/cartograf/gl/micrositios/inicio.cmd
9	Archivo General de la Región de Murcia	http://archivoweb.carm.es/archivoGeneral/arg.inicio
10	Biblioteca Nacional de España (Biblioteca Digital Hispánica)	http://www.bne.es/es/Catalogos/BibliotecaDigitalHispanica/Inicio/index.html
11	Biblioteca Regional de Madrid (Biblioteca Digital de la Comunidad de Madrid)	http://www.bibliotecavirtualmadrid.org/bvmadrid_publicacion/i18n/estaticos/contenido.cmd?pagina=estaticos/presentacion
12	Centro de Información Cartográfica y Territorial de Extremadura (Cartoteca Histórica Digital de Extremadura)	http://217.124.180.27/dguot/Cartoteca/index.html

13	Institut Cartogràfic de Catalunya (Cartoteca Digital)	http://cartotecadigital.icc.cat/
14	Instituto de Cartografía de Andalucía (Buscador de Cartografía Histórica)	http://www.juntadeandalucia.es/institutodeestadisticaycartografia/cartoteca/buscar/search
15	Instituto Geográfico Nacional (Fondos Cartográficos)	http://www.ign.es/fondoscartograficos/
16	Instituto Geológico y Minero de España	http://www.igme.es/internet/sistemas_infor/carto/prin_index.htm
17	Real Academia de la Historia	http://bibliotecadigital.rah.es/dgbrah/es/estaticos/contenido.cmd?pagina=estaticos/presentacion
18	Universidad Autónoma de Madrid. Departamento de Geografía (Cartoteca "Rafael Mas")	http://biblioteca.uam.es/cartoteca/default.html
19	Biblioteca Valenciana Digital	http://bv2.gva.es/es/cms/elemento.cmd?id=estaticos/paginas/inicio.html
20	Biblioteca Virtual del Patrimonio Bibliográfico	http://bvpb.mcu.es/es/estaticos/contenido.cmd?pagina=estaticos/presentacion
21	Biblioteca Digital de la Región de Murcia	http://bibliotecadigital.carm.es/inicio/index.php
22	Biblioteca Virtual de Andalucía	http://www.bibliotecavirtualdeandalucia.es/opencms

Source: By author

A series of dichotomous, qualitative analytical variables were established and appear in *Table 2*. These were designed on the basis of diverse documents and materials. There is a growing literature on evaluation of web sites, many of which do not agree on the general assessment criteria or provide a specific application.

The earliest relevant works regarding IA of websites were published in the late 1990s. Two pioneer works by Caywood (1995) and Nielsen (1995) propose methodologies. The assessment template used in this paper coincides with several of the aspects proposed by the former with regard to access conditions (URL, search engines, standards), resource design and use of adequate language, etc. On the other hand, Nielsen stresses evaluation of parameters such as help and information to users in making search queries and use of language accessible to the user.

From another angle, Ciolek (1996) examines the structuring exemplified in such features as ease of access, and acceptable resource and content design, as well as the display of information or the language of the same. Along these same lines, though circumscribed to the context of the library, Smith (1997) brings together a set of library assessment "tools" for the purpose of helping the user assess information found in such centers. Olsina's (1999)

doctoral thesis provides a list of attributes that comprise the methodology he uses for evaluating the quality of websites.

In the next decade Jiménez Piano (2001) establishes a questionnaire for public and private institutions, and resources with marked scientific features. His work coincides with the section referring to the use of clear and identifiable URLs, updating of resources, navigation and search engines, and display in diverse navigators and identification of the resource owner, etc. Moreover, the approach offered by Codina (2006) also coincides with some of the features analyzed in this paper, such as identification of authorship, target audience, objectives, updating, navigation queries, labels and searches, etc. Finally, the work *Thinking Critically about Web 2.0 and Beyond* (Grassian, 2008) evaluates aspects of resource information and identity, as well date, user registry or ease of navigation. This analysis adapted the "Guía de Evaluación Heurística de sitios Web" developed by Hassan Montero and Martín Fernández (2011), and brings together the greatest number of elements associated with the systems that comprise IA. The template used has been modified and adapted to the object of study. For example, the "Display of Information" block, whose elements of analysis are pertinent to the websites examined, has been included.

The questionnaire applied to each web site agency contains 57 queries, grouped in eight blocks, some of which are not directly quantifiable, but rather come as a result of the display and evaluation of the web site as a whole. An intense analysis of diverse features contained in the following sections has been performed for each entity:

1. General Attributes: objectives, contents, services offered, and design and site structure; in addition to coherence and degree of updating of contents.
2. Identity and Information: corporate identity and means of contacting the company, in addition to data protection and copyright.
3. Language and Writing: quality of the text contents.
4. Labels/Headings: signification and familiarity of labels and headings used for contents.
5. Structure and Navigation: structure of navigation, organization and use of hypertext links.
6. Display of Information: The way in which visual resources are deployed and the operations offered to users (download, printing and metadata).

7. Search: site search function and its options.
8. Help: documentation and contextual help offered to the user for navigation and consolation.

Table 2. Heuristic analysis indicators

General Attributes	
1.1	Are the website objective concrete and well defined?
1.2	Are the contents and services offered congruent with stated objectives?
1.3	Does the website have the proper URL that is clear, correct and easy to remember?
1.4	Are the websites' internal URLs clear and pertinent?
1.5	Does the website provide an accurate and complete outline of the contents and services it offers?
1.6	Is the websites' general structure geared toward the user?
1.7	It the website's general design coherent?
1.8	Is there an indication of when the website was last updated?
1.9	Are some contents offered in several languages?
1.10	Is the website compatible with the search engines?
1.11	Does the page admit publicity?
1.12	Does the resource have a presence in social media?
1.13	Are its contents syndicated?
1.14	Are the free and pay services clearly differentiated?
Identity and Information	
2.1	It the identity of the company/website clearly shown on all pages?
2.2	Does the slogan or tagline, genuinely express what the company is and the services it offers?
2.3	Is the logo meaningful, identifiable and sufficiently visible?
2.4	Does the logo link to home page?
2.5	Is there a link to information about the company, website, webmaster, etc.?
2.6	Does the site provide contact information and mechanisms?
2.7	Does the website provide information regarding protection of personal data of clients or copyright of website contents?
2.8	Is one required to register in order to gain access to any of the resources?
2.9	Does the website offer a user feedback function?
Language and Writing	
3.1	Does the website use the language of users?
3.2	Does it employ a friendly, familiar and intimate tone?
Labels/Headings	
4.1	Are the labels/headings meaningful?
4.2	Are standard labels/headings used?
4.3	Is a single, well-defined, clear system of organization used?
4.4	Does the website use a controlled, accurate system of label and headings?
4.5	Are page titles correct and the result of planning?
Structure and Navigation	
5.1	Are links easily recognized?
5.2	Do clicked links indicate their current status (visited, active, etc.)?
5.3	Do all links take the user to a page with content?
5.4	Does each page have a forward and back button?

5.5	Are there navigation elements (breadcrumbs or home button) to orient the user with regard to location?
5.6	Does the webpage offer a site map or search functions for those wishing to gain direct access to contents without need of navigating?
5.7	Do link images include a title feature describing the page to be visited?
5.8	Do all pages link to other pages?
5.9	Does website offer a virtual tour?
5.10	Does website include links to external sites?
	Display of Information
6.1	Are visual resources such as thumbnails displayed (PDF, DOC, TXT)?
6.2	Are visual resources such as thumbnails of image files displayed (JPG, TIFF)?
6.3	Can images be downloaded and/or printed?
6.4	Do images come with associated metadata?
6.5	Do images offer any added value, such as geo-referencing?
6.6	Do images contain protective water marks?
6.7	Is content provided in other media formats such as (CD-ROM, printed, etc.)?
	Search
7.1	Is it easily accessible and recognizable as such?
7.2	Are advanced searches allowed?
7.3	Does it display search results in a way that is understandable to the user?
7.4	Is help provided to the user when a search come ups empty?
7.5	Does the search function employ controlled documental language (key words, thesaurus, and subject headings)?
7.6	Does it contain classification and/or topic and onomastic indexes?
7.7	Can recent searches be accessed?
	Help
8.1	Is there a Help section?
8.2	Is the Help link clearly visible and always the same in appearance?
8.3	Does the Help section provide Frequently Asked Questions?

Source: By author

Finally, after analysis of each of the 22 entities in the sample, the aggregate results obtained were examined. For the purpose of exposition and consequent conclusions, the following compliance values for the diverse assessment items shall be used: 1 = YES (indicating compliance with indicator) and 0 = NO (indicating failure to comply).

Results

The eight basic analytic blocks appear in the left-most column, with the number of 57 total items assessed appearing in parenthesis (as per *Table 2*). The first row represents the number assigned to each of the 22 entities assessed (shown in *Table 1*). The results of the analysis performed are shown in *Table 3* under 'Totals."

Table 3. Results obtained by entity and sections

Id Entity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
General Attributes (14)	8	9	11	5	11	8	10	8	8	10	8	7	10	5	8	6	8	7	10	11	9	11
Identity and Information (9)	6	7	7	6	6	6	7	6	9	7	4	6	8	5	5	6	5	4	7	7	5	7
Language and Writing (2)	2	2	2	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Labels/Headings (5)	5	3	2	1	2	4	5	5	5	2	5	5	5	4	4	2	5	5	5	4	2	5
Structure and Navigation (10)	7	5	5	5	7	6	7	4	9	6	5	8	6	5	4	6	5	8	6	7	6	8
Display of Information (7)	4	5	4	3	6	4	4	4	2	6	5	5	4	4	4	2	5	2	5	4	5	6
Search (7)	4	4	5	5	5	6	4	6	3	4	6	5	5	4	2	4	5	2	3	5	4	3
Help (3)	0	2	2	0	2	2	0	1	2	2	1	3	2	1	1	2	2	0	2	2	2	0
Totals (57)	36	37	38	25	39	38	39	36	40	39	36	41	42	30	30	30	37	30	40	42	35	42

Source: By author

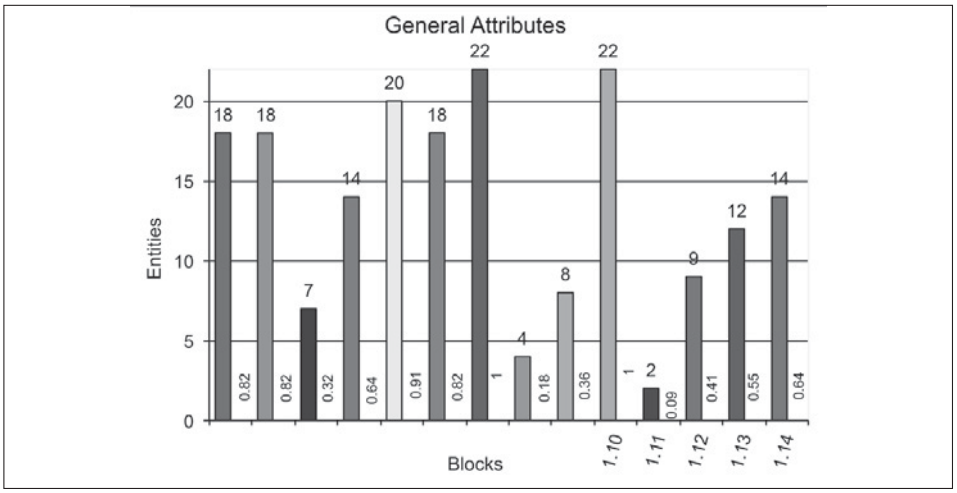
The most relevant results obtained for each of the eight blocks are presented below:

General Attributes

Most to the websites exhibit an accurate, well-defined correspondence between the presentation of objectives and the contents and/or products offered. Moreover, general structure and coherence in the design of entryway and internal pages are conscientiously upheld. Among those features requiring improvement, the following are the most significant:

- The use of permanent internal URLs that can be easily memorized, known as "semantic" URL; i.e., those that faithfully represent the content or subject area of the website and which are easily remembered by the user.
- Indication of the dates of creation and latest update of content, which would lend greater credibility to the site.
- Translation into other languages, at the very least into English, especially those that are part of the *Europeana* network of cultural institutions.
- Presence in social networks to ensure dissemination (news, collection held, etc.) to a broader range of users. Likewise, the matter of syndicating contents should be revisited in order to keep the user informed regarding the new features and services provided by the website.

Chart 1. Results obtained in the General Attributes section.



Source: By author

As shown in *Chart 1*, while 100% of the entities analyzed exhibit a design coherent with content (1.7) and are compatible with any navigator (1.10), only 9.0% include advertising in their pages (Biblioteca Digital Hispánica and the cartographic collections of Instituto Geográfico Nacional). Likewise, only four institutions provide indication of latest update of contents and services. For their part, Memoria Digital Vasca and Biblioteca Virtual del Patrimonio Bibliográfico do not provide content update notices, they do publish current news and events on their respective home pages. The Archivo Histórico Provincial de Zaragoza is the only website that has a devoted content update notice, while the Biblioteca Digital de la Región de Murcia provides a current date without any notice of recent updates.

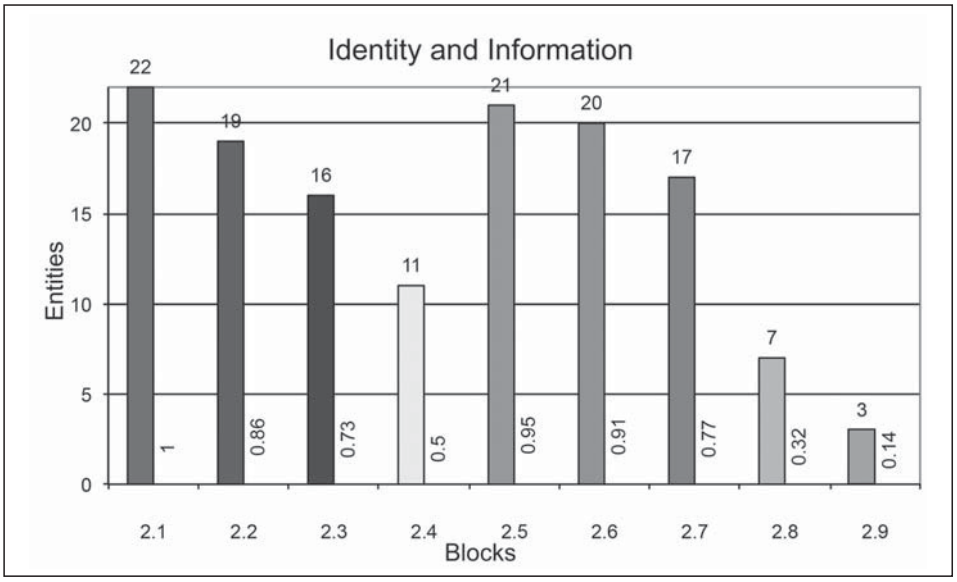
Identity and Information

Most of the entities examined use a logo and a tagline to identify both the resource and its contents. Moreover, they offer information about the entity or website and mechanisms for making contact. The following areas, however, stood out as needing improvement:

- Use of logo as anchor for homepage, which would help the user undo the navigation when he so desires. Compliance with this indicator was evident only in half of the sample.
- Some entities do not have information on protection of personal data and/or copyright.
- Lack of user registry at the time of accessing content. Requiring the user to enroll would allow the entity to examine user/visitor profile, the type of searches performed, count the number of times content is accessed, etc., all of which can serve, in turn, to guide improvement of the website.
- In this regard, it is also recommendable to include a user complaint/feedback function.

As shown in *Chart 2*, most entities in the sample offer users information about the institution as well as contact information. Only three entities in the sample, however, provided a user feedback mechanism (Fons Sol-Torres, Archivo Real y General de Navarra and the Archivo General de la Región de Murcia).

Chart 2. Results for Identity and Information.



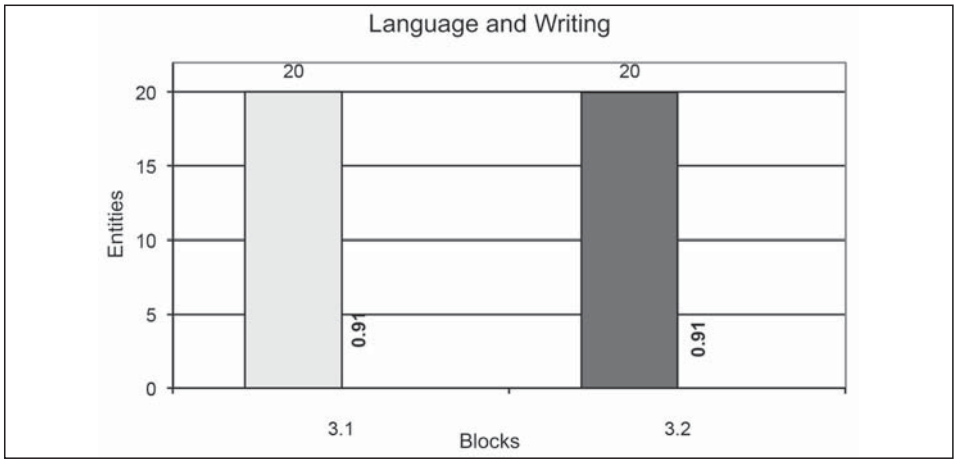
Source: By author

Language and Writing

The results obtained for both queries are the same. As shown in *Chart 3*, these criteria are adequately met by all entities except Fons Sol-Torres and Portal de Archivos Españoles (PARES), largely because the users visiting these sites are laypersons with regard to the specialized scientific contents of the site. The assessment of the factor depends on whether the user continues to visit or otherwise desists because of the opaqueness of the language employed.

The website of Fons Sol-Torres employs a complicated user interface in terms of search and use of language. Rather than deficient use of language, we find linguistic barriers in the overuse of English and Catalan, a situation that restricts the user's ability to navigate and search. The PARES website employs highly technical and overly efficacious terms from the field of documental science, such as signature, description index, exact signature, incomplete signature, search strategies, etc. These terms can confuse the user.

Chart 3. Results for Language and Writing.

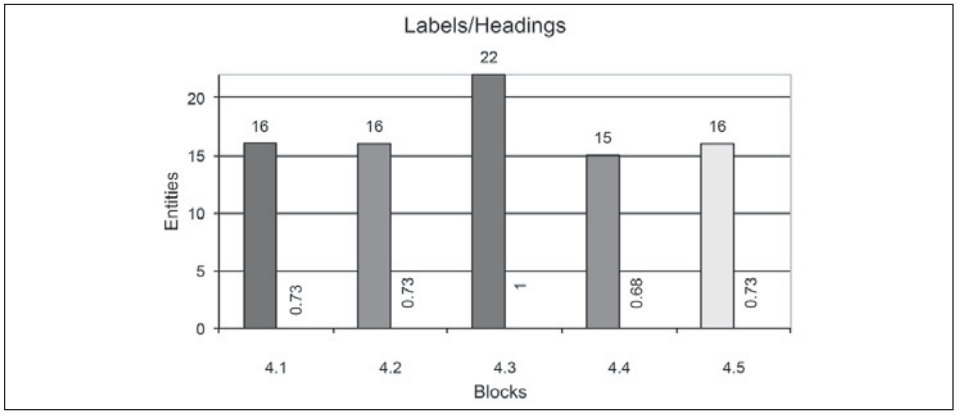


Source: By author

Labels/Headings

Half of the entities complied with 100% of the indicators. Standard and meaningful labels and headings are used for each option or task. Moreover, these labels or headings are controlled and accurate while existing within a well-defined and organized system. Additionally, the title of the main page and the title of the source code *title* element are the same. This is very important because it is the first thing the user encounters on the page and constitutes the first opportunity to provide the user with concrete, accurate information about the contents of the resource. The other 50% of the sample should undertake a review of these matters to prevent leading the user down blind alleys.

Chart 4. Results obtained for Labels/Headings.



Source: By author

The relationship and link between queries 4.1 (meaningful headings), 4.2 (standard labels) and 4.4 (controlled, accurate heading system) is quite evident as shown in *Chart 4*. Fully 73% of the entities analyzed employed meaningful headings that express a defined concept.

The remaining 27 % employ headings that confuse the user, such as the cases of Memoria Digital Vasca and Fons Sol-Torres, which incur in this problems for the reasons already described previously. The use of a foreign language can encumber many users. When a foreign language is used in task headings, this can make interaction with the system very difficult. When standardized, meaningful headings and not used, the user can feel lost or confused during the navigation/consultation process.

The website PARES also fails to meet this standard in that it employs specialized language in its headings. The Biblioteca Digital Hispánica, with its structure oriented to organization, uses headings that stress internal procedures. The Instituto Geológico y Minero de España (IGME) has the same content appearing under several different headings, i.e., the collection, catalogues and digital library comprise the same collection. In this way the user receives erroneous orientation during searches. Finally the Biblioteca Digital de la Región de Murcia also uses headings that cause confusion. The option "Content Search" takes the user to a search window and a set of links to selected documents of diverse types and topics; under the heading "Catalogue Search," a screen appears with advanced search options.

Structure and Navigation

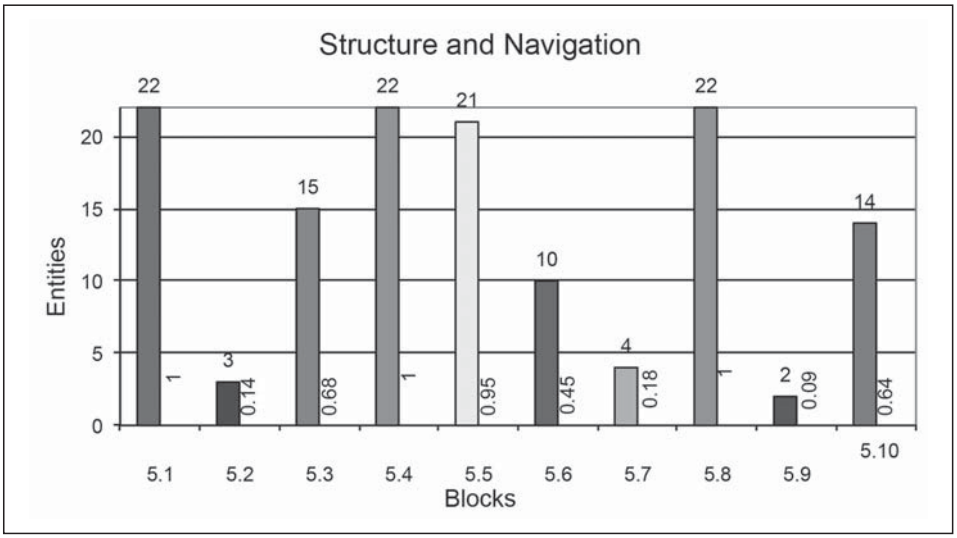
Under this section, only 14% of the sample entities distinguish their links (largely through the use of color) once they have been clicked. This visual prompt undoubtedly helps orient the user. Orphan pages, i.e., those without content did not appear in any of the sample websites; however, there were both misdirected links and links that failed to function properly. Likewise, this percentage reflects the presence of navigation elements that orient the user, including breadcrumbs, forward and back buttons in internal pages and a link to homepage by clicking the logo.

Thus, the poorest assessments came in for following features:

- Inclusion of a site map or internal search function in order to gain direct access to contents without need of navigating.

- Links to external sites. Links to official sites in the same field should be considered. Also links to similar sites in other parts of the world should be provided.
- Review the *title* attribute of the resource images to aid search engines find the resource quickly and thereby improve the positioning of the query result.

Chart 5. Results obtained in Structure and Navigation.



Source: By author

The data shown in *Chart 5* demonstrate that map archives serve to aid and orient the user. This is evident in the results of parameter 5.1 (recognizable links), 5.4 and 5.8 (orientation elements). Interestingly only 9.0% of the sites evaluated (PARES and the Archivo General de la Región de Murcia) include a virtual tour of installations and collections.

Display of Information

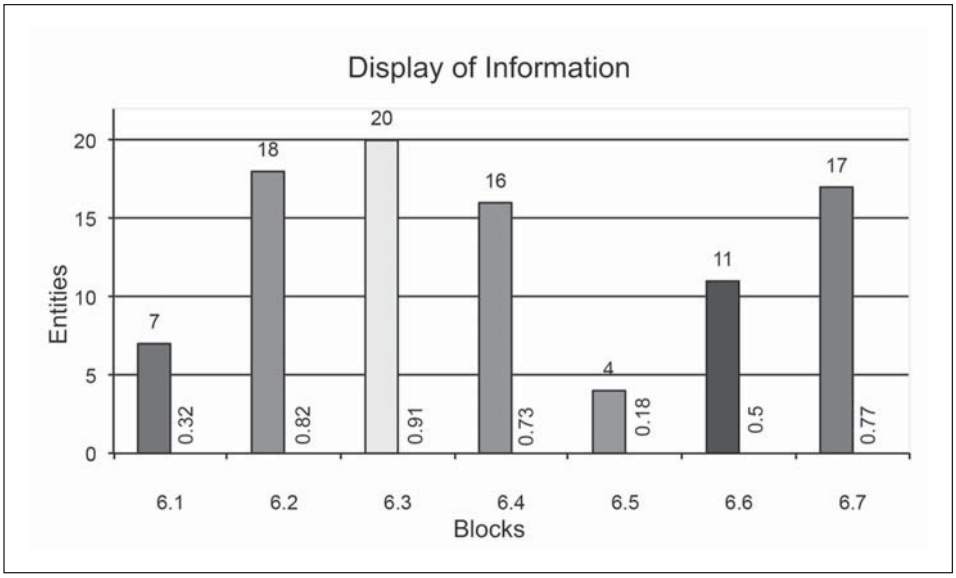
Chart 6 shows that all entities offer digitized contents that can be properly viewed (mostly in JPG and PDF files) by users. Likewise, most of the entities allow downloading and/or printing of images. Only two entities do not offer this option: Arquivo do Reino de Galicia (Galiciana) and the Instituto Geológico y Minero de España).

A high percentage of entities offer standardized descriptions of their records. The most frequently used standards are ISBD, MARC, ISO 19115,

METS, Dublin Core and EDM (Europeana Data Model). Additionally, most of the materials they hold have been presented in other media such as print editions (catalogues, inventories) and expositions, etc.

The poorest results are seen in the use of water marks, a copyright and use protection device appearing in only 50% of the sample. Low scores are also seen for the parameter of allowing exploitation beyond simply viewing.

Chart 6. Results obtained for Display of Information.



Source: By author

Search

All of the websites have an identifiable search system that provides understandable results for the user. Nonetheless, not all of the entities include the search function in the same site. For example, sites run by Memoria de Madrid, Fons Sol-Torres and Biblioteca Digital de la Comunidad de Madrid place the search function in the upper left, while Archivo del Patronato de la Alhambra and Generalife have it at the bottom of the page. In contrast, the sites for Histórico Provincial de Zaragoza, el Arquivo do Reino de Galicia, and others have it in the center of the page. Eighteen of the 22 sample entities offer advanced search options

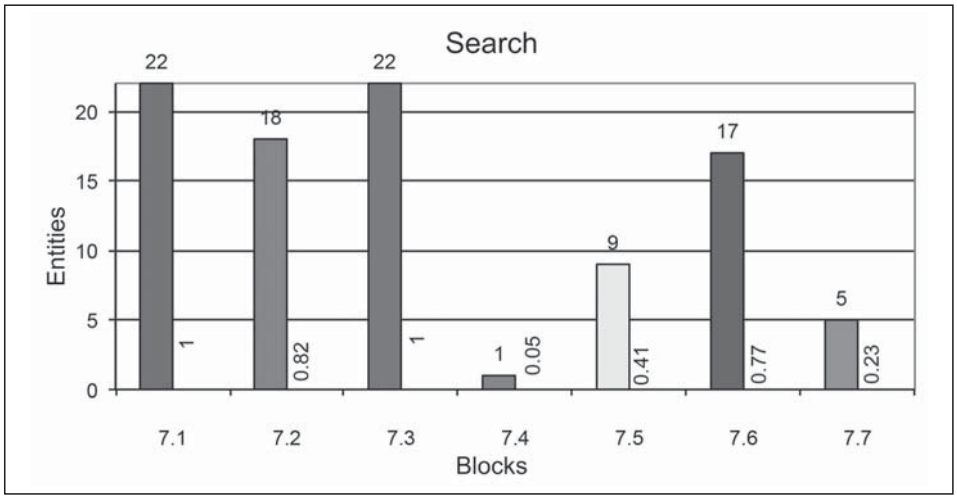
For the parameter of use of documental languages (key words, thesaurus, material headings), this is allowed in only 9 of the sample entities, while in-

dexes and/or classification (thematic, geographic, chronological) are evident in 17 entities.

As shown in *Chart 7*, the area of user help (7.4) needs to be seriously reviewed. Only the Institut Cartogràfic de Catalunya fulfills this function, while all other entities merely "inform" the user of the lack of results without offering alternatives. Many websites also need to include a direct link for users to the latest searches, as only 23% offer this function.

In this block, the Instituto Geográfico Nacional stands out in that it is not equipped with a search function per se, but rather provides three consultation options: Geographic search, Text search and Geographic entities search, which are not otherwise included in the first option.

Chart 7. Results obtained for Search.

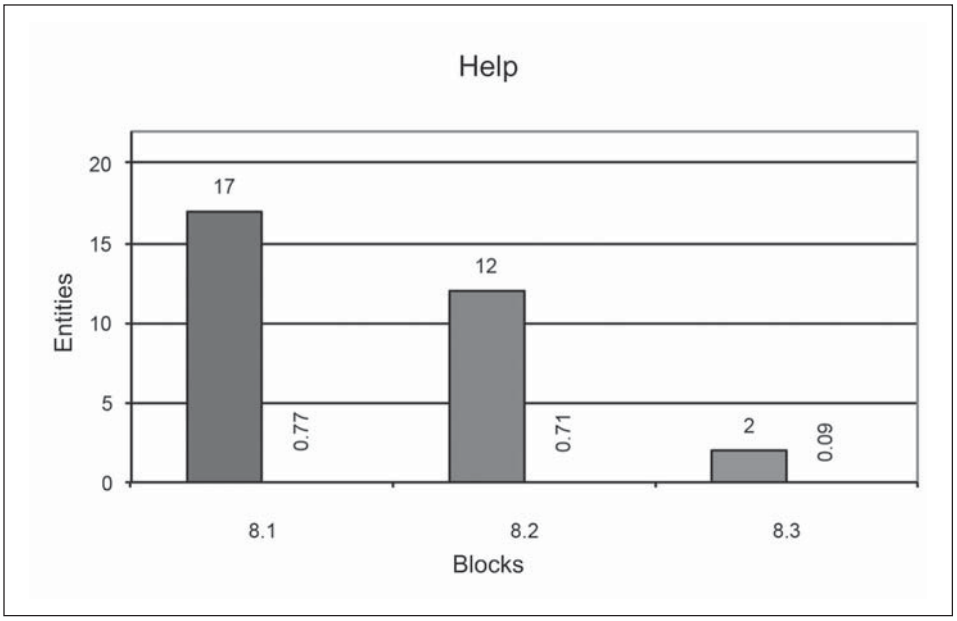


Source: By author

Help

Finally, *Chart 8* shows that only 17 sample entities have a Help section to guide users through the diverse tasks and options available. Of these, 12 websites place the button on the upper right of the page, while the rest place it in less common places. As for FAQs, only Cartoteca Histórica Digital de Extremadura and Memoria Digital Vasca provide this resource. Moreover, Biblioteca Virtual de Andalucía and Fons Sol-Torres provide neither Help nor FAQs.

Chart 8. Results obtained for Help.



Source: By author

Conclusions

In view of the results obtained, we can assert that *cartotecas* tend to present their information as merely digitized objects, without providing much added value beyond viewing. The diverse cartographic archival entities (*cartotecas*) employ the elements and resources inherent to IA in many ways. The design of pages must be cohesive throughout the site with all features aimed at helping the user find the documents and information sought. One might ask what distinguishes one *cartoteca* from another, and the answer may be found in IA. From this perspective, the content presented is as important as how it is presented and the degree of user accessibility attained.

The digital cartographic archival entities should aim to facilitate user consultations in order to achieve higher degrees of user satisfaction through the use of diverse help elements. In this light, it is odd that many websites included in European collaborative networks are available only in the home language. Moreover, these websites do not exploit social networks in any significant way, despite their growing importance, nor do they exploit syndication of contents. All of these avenues should be explored, since the current

trend in the field is to establish collaboration networks or work groups with the aim of sharing and unifying knowledge.

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